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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/022,349	12/20/2001	Hann-Ping Hwang	HWAN3013/EM	2598
23364	7590	04/05/2004	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			WILLE, DOUGLAS A	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 04/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/022,349

Applicant(s)

HWANG ET AL.

Examiner

Douglas A Wille

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-23,25-32 and 34-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-23,25-32,34-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 20 – 23, 25 - 28, 37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scott et al. in view of Matsuoka et al. and Sugiyama et al.
3. With respect to claim 20, Scott et al. show (see Figure 3 and column 2, line 50 et seq.) a substrate 10, a phototransistor 250, a bipolar transistor 260 with collector layers 30, 40, base layer 60, emitter layer 90, 100 and distinct mesas are formed which are separated by a space which provides insulation and are formed on a single substrate. The Scott et al. device is a high speed device (column 2, line 30), has a multilayer collector 30, 40 and is intended for edge illumination. Matsuoka et al. show a similar device (see cover Figure and column 4, line 48 et seq.) which is intended for top illumination and uses layers 7, 7a as absorption layers with 3, 4, 5 and 6 being part of the collector. It would have been obvious to use the Matsuoka et al. structure in the Scott et al. device for a top illuminated device to provide the structure for a different application. Scott et al. and Matsuoka et al. both show III-V materials but Sugiyama et al. show that a related structure (see Figure 17 and column 13, line 57 et sq.) can be formed with a Si substrate and uses SiGe since SiGe can be used to select the wavelength of sensitivity and uses an inexpensive Si process and the absorbing layer of Sugiyama et al. is a Si/SiGe superlattice (column 1, line 37). It would have been obvious to use the Sugiyama et al. material to achieve the wavelength selection capability and the use of inexpensive processing. Note also that

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Sugiyama et al. show that recombination at the end faces of a mesa can cause recombination (column 2, line 41) and therefore uses a dielectric isolation 5.

4. With respect to claim 21, Sugiyama et al. show a Si wafer (column 7, line 23).
5. With respect to claim 22, there is a deep trench 5 filled with an insulator (column 8, line 66).
6. With respect to claim 23 the collector is Si.
7. With respect to claim 25, the base is Si and the thickness is a design parameter subject to routine experimentation.
8. With respect to claim 26, the emitter is Si.
9. With respect to claim 27, it is standard that for bipolar devices the structure is either pnp or npn.
10. With respect to claim 28, the emitter either covers all or part of the base.
11. With respect to claims 37 and 39, insulator 5 extends to the wafer.
12. Claims 29 – 36 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuoka et al. in view of Sugiyama et al.
13. With respect to claim 29, Matsuoka et al. show (see cover Figure and column 4, line 48 et seq.) a bipolar/detector device on a single substrate, which is intended for top illumination and uses layers 7, 7a as absorption layers with 3, 4, 5 and 6 being part of the collector and has and base 8 and emitter 9. Matsuoka et al. show III-V materials but Sugiyama et al. show that a related structure (see Figure 17 and column 13, line 57 et sq.) can be formed with a Si substrate and uses SiGe since SiGe can be used to select the wavelength of sensitivity and uses an inexpensive Si process and the absorbing layer of Sugiyama et al. is a Si/SiGe superlattice

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(column 1, line 37). It would have been obvious to use the Sugiyama et al. material to achieve the wavelength selection capability and the use of inexpensive processing. Note also that Sugiyama et al. show that recombination at the end faces of a mesa can cause recombination (column 2, line 41) and therefore uses a dielectric isolation 5.

14. With respect to claim 30, Sugiyama et al. show a Si wafer (column 7, line 23).
15. With respect to claim 31, there is a deep trench 5 filled with an insulator (column 8, line 66).
16. With respect to claim 32, the collector of Matsuoka et al. includes layers 2 – 7.
17. With respect to claim 33, the absorbing layer of Sugiyama et al. is a Si/SiGe superlattice (column 1, line 37).
18. With respect to claim 34, the base is Si.
19. With respect to claim 35, the emitter is Si.
20. With respect to claim 36, it is standard that for bipolar devices the structure is either pnp or npn.
21. With respect to claim 38, insulator 5 extends to the wafer.

Response to Arguments

22. Applicant's arguments filed 1/29/04 have been fully considered but they are not persuasive.
23. Applicant states that it is not obvious to adapt the Scott et al. device to use the Matsuoka et al. top illumination structure. It is known in the detector art and it is obvious geometrically that an edge illuminated device suffers in collection efficiency since the absorbing area is limited by the ability to produce thick layers. Note that with semiconductor layers with thicknesses on the

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order of, say 1 micron, the total thickness of the absorbing layer will be on the order of several microns. This means that the light that is to be detected must be focussed to a spot of that size. Standard pn junction detectors are top illuminated, as are CCD devices. This geometry provides an ability to tailor the device size (i.e. active area) to meet optical design needs and device response characteristics such as sensitivity and noise equivalent power. Is Applicant aware of side illuminated detectors which are commercially available?

24. Applicant continues with arguments addressed to unclaimed features and provides a piecemeal analysis of the prior art quoted by Examiner.

25. Applicant states that Matsuoka et al. has a P-i-N structure and doesn't show a MQW but Sugiyama et al. shows the MQW as noted in the rejection above.

Conclusion

26. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas A Wille whose telephone number is (571) 272-1721. The examiner can normally be reached on M-F (6:15-2:45).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A handwritten signature in black ink, appearing to read 'Douglas A. Wille', written in a cursive style.

Douglas A. Wille
Primary Examiner

April 2, 2004